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report on
PLANT
DISEASE

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SNAPDRAGON RUST

Rust caused by the fungus *Puccinia antirrhini* is one of the most widespread and damaging diseases of snapdragon (*Antirrhinum majus*). This worldwide disease was first reported in Santa Cruz, California, in 1879. The first known instance of it in Illinois was at Lake Forest in 1912. A few of the related wild native species of *Linaria* (butter-and-eggs) and *Cordylanthus* (bird's beak) are only slightly susceptible.

Figure 1. Snapdragon rust. Note the "halos" around the rust pustule (courtesy G.W. Simone).

Infection in snapdragons may develop rapidly, stunting the shoots and flower spikes. When severe, rusted plants may wilt and die before or during flowering. During dry weather, severely rusted leaves dry up and die. In warm humid regions the rust pustules are invaded by secondary fungi (principally species of *Fusarium*) that may kill the leaves and stems. Rust is most serious in cool humid climates and is checked by extended periods of hot, dry weather.

Figure 2. Close-up of rust on snapdragon leaves.

Rust affects snapdragons of all ages, from seedlings and cuttings to mature plants, both in the field and in the greenhouse. Leaves become the most heavily infected, but young stems, petioles, flower (calyx) structures, and seed capsules often are also severely attacked. Leaves that are heavily rusted wilt as though from lack of water. When flowers are infected, the ovaries are destroyed, reducing seed production.

SYMPTOMS

The first symptom is the presence of scattered, small yellow flecks, less than 1/16 (2 mm) in diameter, just under the epidermis on the undersides of the leaves. Under favorable conditions for growth of the fungus, the yellow flecks mature within 48 hours into chestnut-brown to chocolate-brown pustules ringed by a yellowish green halo (Figure 1). The pustules occur in greatest numbers on the underside of the leaf, although they may also occur on the upper leaf surface (Figures 1 and 2). Commonly, they occur in a pattern of concentric rings. Chocolate-brown, powdery masses in the center of the mature pustules are the spores of the rust fungus (Figure 2).

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DISEASE CYCLE

The rust fungus survives the winter out-of-doors as spores (uredospores) on infected plants. In greenhouses, where overhead watering is practiced, infection most likely originates from uredospores on diseased stock plants. The spores are primarily airborne but are also spread about by splashing water or insects. Germination and infection of the spores are optimum at 50° to 55°F (10° to 12°C). The period of incubation from spore germination to the appearance of the yellow flecks varies from 8 to 14 days. The optimum temperature for completion of the life cycle of the fungus is 70° to 75°F (21° to 23°C) with only a small percentage of infections surviving temperatures of up to 90° F (32°C). The uredospores are killed by prolonged exposure to temperatures above 94° F (34°C). Thus, the severity of snapdragon rust is predictable based on climatic conditions.

New infections and disease development are favored by cool nights and warm days combined with abundant dews, light rains, or syringing of the foliage. If temperatures remain between 45° and 65°F (7° to 18°C) when plants are wet from dew or rain for six to eight hours, infection by air-or water-borne uredospores is almost certain. If, in addition, day temperatures reach 70° to 75°F (21° to 23°C) but do not often exceed 80° to 90°F (26° to 32°C), development and sporulation of the rust fungus are rapid. The complete disease cycle from initial or primary infection through pustule formation and sporulation to secondary infections may be completed every 12 days.

Favorable conditions for infection and development of disease occur along the Pacific Coast and, as a result, rust is severe there out-of-doors. In much of the Midwest and South, where high temperatures prevail from late spring into early autumn, rust is relatively unimportant except where snapdragons are grown in greenhouses during the fall, winter, or early spring and where overhead watering is practiced.

Many rust fungi have life cycles that involve alternate hosts. No alternate host for the snapdragon rust pathogen is known. The uredial and telial states are known for this rust, but only the uredospores play a part in the disease cycle.

CONTROL

1. Start seedlings in a greenhouse free of rust-infected snapdragons. If starting with cuttings, select them from disease-free stock. The rust fungus is rarely seed-borne, but seed is not known to be a source of infection because a diseased germinating seed, and the rust parasite, die before reaching the soil surface.

2. Keep the humidity in the greenhouse to a minimum by increasing air movement and heating at night.

3. Space the plants far enough apart to allow for good air circulation.

4. Water in the morning rather than in the evening. Surface watering of beds is better than syringing the foliage.

5. Rust-resistant snapdragons are available in most colors and should be used in preference to the susceptible varieties. Unfortunately, resistant varieties may be susceptible when grown in some areas. At least two races and various strains of the rust fungus are known. Their presence complicates the breeding for resistance, which is controlled by a single dominant gene. Modifying genes exist that permit the selection of immune plants from highly resistant parents.

6. Spray the plants with a fungicide when the above cultural practices fail to check the development and spread of snapdragon rust. For adequate protection, it is necessary to cover thoroughly all parts of the leaves and stems with a fine mist. Spray young plants every 7 to 14 days until they are 15 to 16 inches tall. Spray to the point of run-off.

   Spraying is more effective than dusting. Sprays are required at 7- to 14-day intervals to keep the young, susceptible growth adequately covered and protected. For outdoor-grown snapdragons, if the period is unusually rainy, the spray interval should be shortened to five days; if dry, lengthened up to 10 or 14 days. If possible, sprays should be applied just before a rainy period to provide maximum protection.

   A commercial spreader-sticker (surfactant) should be added to the spray solution–several drops to ½ teaspoonful per gallon of water. This addition reduces surface tension, ensures better wetting, and makes the spray adhere to the foliage. When using a fungicide and spreader-sticker, always follow the directions on the container label.

Consult the Illinois Homeowners' Guide to Pest Management, available at your nearest Extension office for recommendations and products. This publication is revised annually.